REMARKS

This amendment is responsive to the Office Action of October 18, 2006. Reconsideration and allowance of claims 1-15 as set forth herein are requested.

The Status of the Claims

Claims 1-8, 10, and 11 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Oshio et al., U.S. Pat. No. 6,515,476 (hereinafter "Oshio").

Claim 9 is indicated as containing allowable subject matter.

The Oshio reference

Oshio discloses two successive phase corrections. First, there is a phase correction represented by elements (704, 706, 708, 710, 712, 714, 716, 718) of Fig. 5 and described at columns 7 and 8. This phase correction corrects for magnetic field inhomogenity. Second, there is a final water/fat separation operation represented by elements (722, 724, 726) of Fig. 5 and described at column 9. This second operation involves a fat signal peak shift operating on the first-corrected data.

Oshio's first phase correction

Referring to Oshio Fig. 5 and columns 7 and 8, Oshio's first phase correction involves multiplying the phase-versus-position data (Fig. 6A) by a factor n=4 (706) which enhances the curvature of transitional areas between water and fat (Fig. 6B), then low-pass filtering (710) (see also Fig. 7A) to remove the enhanced curvature (Fig. 7B). The resulting data is phase-unwrapped (714) (see also Figs. 8A and 8B) and multiplied by inverse factor 1/n=1/4 (716) to produce the corrected phase (718) (see also Fig. 8C) that is combined with the power image (702) to give a phase-corrected image.

This first phase correction of Oshio does not utilize a histogram or distribution of phase values, but rather operates directly on the phase-versus-position data, that is, in the spatial domain. There is no control of this first phase correction based on a distribution of phase values. Moreover, there is no use of a test function to assess the effectiveness of the first phase correction. Still further, there is no polynomial phase correction in which the polynomial has adjustable polynomial

coefficients. At most, the multiplying by a constant (n=4) might be regarded as a a polynomial correction of order zero, but this correction has no adjustable coefficients.

Oshio's second phase correction

Referring to Oshio Fig. 5 and column 9, Oshio's fat/water separation involves a second phase correction that does incorporate a histogram or distribution of the first-corrected phase values (724) (see Fig. 10). The phase modification section (722) performs the second phase correction, which is limited to shifting the fat signal to a separation $\pi/2$ respective to the water signal. The acquisition performed by Oshio is expected to produce the water and fat peaks with about a separation of $\pi/2$ (see col. 9 lines 28-31), but the actual separation may deviate from this expected separation by an amount δ (Fig. 10; col. 9 lines 31-36). The second phase correction shifts the phase of the fat peak to remove this extra δ (*Id.*). By doing so, the phase difference between the water and fat is precisely $\pi/2$, which has the advantage that the water and fat are represented by the real and imaginary parts of the complex image. This makes the water/fat separation (726) straightforward.

This second phase correction is controlled on the basis of the histogram (724) insofar as the histogram is used to identify the water and fat phase peaks. However, there is no use of a test function to assess the effectiveness of the second phase correction. Applicants also find no disclosure or fair suggestion of a polynomial phase correction in which the polynomial has adjustable polynomial coefficients. The second phase correction appears to merely involve a phase shift of the fat peak.

The claims patentably distinguish over the references

Claim 9 has been placed into independent form including the limitations of the base claims. As claim 9 was indicated at page 3 of the Office Action as containing allowable subject material, it is respectfully submitted that claim 9 as so amended is in condition for allowance.

Regarding the reasons for allowable subject matter set forth at pages 3 and 4 of the Office Action, Applicants understand these reasons as stating that the combination of limitations set forth in claim 9 define allowable subject matter.

Claim 1 calls for a magnetic resonance imaging system comprising a reconstruction unit arranged to reconstruct a complex image of complex valued pixels from magnetic resonance signals, compute a distribution of phase values of the complex image, apply a phase correction to the complex image to form a corrected complex image, and iteratively adjust the phase correction on the basis of the distribution of phase values of the complex image.

The amendment adding the phrase "iteratively adjust" is supported in the original specification at least at page 4 lines 21-25.

The first phase correction of Oshio does not involve computing a distribution of phase values, and does not involve any iterative adjustment. The second phase correction of Oshio involves computing a distribution of phase values, but does not involve any iterative adjustment. Rather, the distribution of already first corrected phase values is used to identify the water and fat peaks, and the second phase correction shifts the fat peak to the desired $\pi/2$ separation from the water peak. Thus, there is no disclosure or fair suggestion in Oshio of iteratively adjusting a phase correction on the basis of a distribution of phase values of a complex image.

Claim 3 calls for a magnetic resonance imaging system as claimed in claim 2, wherein the phase correction is iteratively adjusted on the basis of a test function of the histogram. Neither phase correction of Oshio utilizes a test function to assess the effectiveness of the phase correction. The Office Action at page 2 claims to have found such a disclosure at Oshio col. 9 lines 16-52. Applicants do not find any mention of a test function there or elsewhere in Oshio. If the stated rejection of claim 3 is maintained in the forthcoming Office Action, Applicants respectfully request a clarification of the rejection identifying the element or process disclosed in Oshio alleged to correspond to a test function.

Claim 5 calls for a magnetic resonance imaging system as claimed in Claim 4, wherein the test function is formed by the histogram power function. The Office Action at page 3 claims to have found such a test function at Oshio col. 9 lines 16-52. Respectfully, Applicants find no such disclosure in the cited section of Oshio or elsewhere in Oshio. A power function implies raising something to a power, i.e., a function of the form x^y. In the example histogram power function set forth at least at page 2 line 30 of the present application, "x" corresponds to h_j, the number of phase

values in the j-th bin of the histogram, while "y" corresponds to the square power "2". Applicants find nothing of the form x^y in the cited section of Oshio. If the rejection of claim 5 on the stated basis is maintained in the forthcoming Office Action, Applicants respectfully request a clarification of the rejection identifying the element or process disclosed in Oshio alleged to correspond to a power function.

Claim 6 has been placed into independent form including the limitations of base claim 1. Claim 6 calls for a magnetic resonance imaging system comprising a reconstruction unit arranged to reconstruct a complex image of complex valued pixels from magnetic resonance signals, compute a distribution of phase values of the complex image, apply a polynomial phase correction to the complex image to form a corrected complex image, said polynomial phase correction being represented by its polynomial coefficients, and control the polynomial phase correction on the basis of the distribution of phase values of the complex image.

The Office Action at page 3 claims to have found a phase correction on the basis of a polynomial phase correction, said polynomial being represented by its polynomial coefficients at Oshio col. 9 lines 16-52. Respectfully, Applicants find no such disclosure in the cited section of Oshio or elsewhere in Oshio. At most, one might consider the factors n=4 and 1/n=1/4 used in the first phase correction of Oshio as zeroth order polynomials. Such a "polynomial" has no adjustable coefficients and so the control called out in claim 6 is not possible, much less disclosed or fairly suggested in Oshio. If the rejection of claim 6 on the stated basis is maintained in the forthcoming Office Action, Applicants respectfully request a clarification of the rejection identifying the element or process disclosed in Oshio alleged to correspond to a polynomial phase correction.

Claim 7 calls for a magnetic resonance imaging system as claimed in claim 6, wherein the reconstruction unit is arranged to control the phase correction by adjusting polynomial coefficients of the polynomial phase correction. Even if the multiplicative factors n=4 and 1/n=1/4 are broadly construed as polynomials, they are not adjustable and have no adjustable polynomial coefficients.

Claim 10 calls for a magnetic resonance imaging method comprising, among other elements, iteratively adjusting a phase correction on the basis of a

distribution of phase values of the complex image. Oshio does not disclose such an iterative adjusting process.

Claim 11 calls for a computer program comprising instructions to compute a distribution of phase values of a complex image, apply a phase correction to the complex image to form a corrected complex image, and iteratively adjust the phase correction on the basis of a test function of the distribution of phase values of the complex image that discriminates whether the distribution is predominated by peaks or by broader structures. Oshio does not disclose either iterative adjustment or utilizing a test function to assess effectiveness of phase correction. Thus, Oshio does not disclose the operative combination of these features as called out in claim 11.

Claims 12-15 are dependent claims added to more particularly call out certain patentable features disclosed in the specification. **Claim 12** is supported in the original specification at least at page 2 lines 29-31. **Claim 13** is supported in the original specification at least at page 2 lines 23-24. **Claim 14** is supported in the original specification at least at page 4 lines 18-24. **Claim 15** is supported in the original specification at least at page 3 lines 3-14. It is respectfully submitted that claims 12-15 are allowable at least because the base claims are allowable.

In view of the above remarks, it is respectfully submitted that all claims 1-15 are in condition for allowance. Accordingly, Applicants respectfully request that all claims 1-15 be allowed.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-15 (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, she is requested to telephone the undersigned at (216) 861-5582.

Respectfully submitted,

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